

REMARKS/ARGUMENTS

In the Claims:

Claims 14-18, 20-23, 27-31, 33-36, 46-49, 51-56, and 58-61 remain in this application. Claims 14-16, 18, 20-23, 27-29, 31, 33-36, 46-49, 51, 52, 54, 56, and 58-61 have been amended. Claims 19, 24-26, 32, 37-39, 50, 57, and 62-64 have been withdrawn.

Claims 14-16, 18, 20, 27, 31, 33, 47-48, 54, 56, and 58 have been amended to change a list connected by “and” to a list connected by “or”, to clarify the meaning of the claims.

Rejections Under 35 U.S.C. 112:

Claims 14-18, 20-23, 27-31, 33-36, 46-49, 51-56, and 58-61 were rejected under 35 U.S.C. 112 first and second paragraphs as failing to comply with the written description and enablement requirements and as being indefinite. The Examiner based the rejections on the meaning of the term “core,” stating that one of skill in the art would not understand the terms “thin core” or “coreless.”

However, the Examiner has cited a clear definition of “core” from the IEEE Standard Dictionary of Electronic and Electronic Terms, Sixth Edition, from which one of skill in the art would understand the terms “thin core” and “coreless.” Additionally, the specification, as was pointed on pages 4 and 5 of the Appeal Brief filed August 19, 2003, adequately describes the meaning of the terms.

The IEEE Standard Dictionary cited by the Examiner defines “core” as “the **central layer or basic support** of certain types of laminated media” (Office Action, page 3, emphasis added). The Examiner then appears to ignore this definition (in particular

the words “central layer” and “basic support”), stating that the core layer, “will be any layer on which other layers are formed.” (Office Action, page 3). In contrast to the Examiner’s statement, any layer on which other layers are formed is **not** the central layer or basic support. The Standard Dictionary cited by the Examiner did not define “core” as “any” layer as the Examiner appears to be asserting; rather, it defined “core” as “the central layer or basic support.”

Applicant requests that the Examiner apply the cited definition. Further, the Specification at page 8, line 11, describes a thin-core substrate core as “0.1-0.5, and more specifically 0.4 mm” in thickness. Thus, from the Examiner’s own definition and the Specification, it is clear that “thin core” means that the central layer or basic support is between about 0.1-0.5 mm thick. It is also clear that “coreless” means the layered substrate has no one central layer that provides basic support.

Since the terms “thin core” and “coreless” are, from the Examiner’s cited definition and from the specification, clear, Applicant requests that the Examiner withdraw both the rejections that are based on the meaning of those two terms.

Additionally, regarding claims 52-56 and 58-61, the Examiner stated that an input/output device is not described in the disclosure. Applicant respectfully disagrees. On page 6 of the Specification, at the last two lines of the first full paragraph, a system is described that may include a notebook computer, a cell phone, a PDA, etc. One of skill in the art would understand such systems to include input/output devices. For example, notebook computers, cell phones, and PDAs have LCD screens (an output device) and buttons or keys (an input device).

Finally, claims 23, 36, and 61 were rejected under 35 U.S.C. 112 second paragraph as being indefinite. The Examiner stated that the word "if" in these claims made the claims indefinite. The claims have been amended to remove the word "if."

Rejections Under 35 U.S.C. 102(b):

Claims 14-18, 20-23, 27-31, 33-36, 46-49, and 51 were rejected under 35 U.S.C. 102(b) as being anticipated by Tsukamoto (US 5,841,194) (hereinafter "Tsukamoto"). Claims 14, 27, and 36 were also rejected under 35 U.S.C. 102(b) as being anticipated by Ho (US 6,287,890) (hereinafter "Ho").

Claim 14 has been amended to recite that the substrate includes at least five layers, and that none of the layers has a thickness greater than about 0.5 mm. Claim 27 has been amended to recite that the substrate includes at least five layers. Claim 46 has been amended to recite that the substrate is a coreless substrate that includes at least five layers, and that none of the layers has a thickness greater than about 30 microns. Support for these amendments can be found on page nine of the Specification, which discloses a thin core 512', a coreless substrate 710, multiple die side laminate layers 514' and pin side laminate layers 516', and in the first full paragraph of page eight of the Specification, which discloses the non-core layers as being between about 15 and 30 microns thick. Tsukamoto and Ho fail to disclose such multi-layered substrates.

Further, the Examiner has mischaracterized the metal substrate #14 of Ho as a stiffener. Since the layers of the substrate #12 of Ho are formed on the metal substrate #14 (Ho, col. 6, lines 21-29), the metal substrate #14 is, according to the IEEE Standard Dictionary Definition cited by the Examiner, actually the core of the substrate. The

metal substrate #14 is the core of the substrate and not a stiffener because the metal substrate #14 is the basic support for the substrate of Ho. Thus, Ho has a core with a thickness of at least 30 thousandths of an inch (Ho, col. 6, lines 56-58), which is greater than 0.7 mm.

Claim 16 has been amended to recite that the stiffener is substantially made of a ceramic material, and to clarify language. Tsukamoto fails to disclose such a substantially ceramic stiffener.

Claims 21 and 34 have been amended to recite that the stiffener has a top surface that is substantially co-planar with a top surface of a combination of an IC-die with an integrated heat spreader (IHS). Tsukamoto fails to disclose a stiffener with a top surface substantially co-planar with a combination of an IC-die and IHS.

Claims 22, 35, and 51 have been amended to recite that the stiffener is disposable to co-support a heat sink with a combination IC-die and IHS. Tsukamoto fails to disclose such an arrangement.

Claims 23 and 36 have been amended to remove the word “if” to positively recite that the main body of the stiffener is electrically conductive and that the stiffener includes an insulator. Tsukamoto fails to disclose a stiffener with an insulator to insulate electrical members on stiffener-opposing areas of the substrate. Contrary to the Examiner’s assertion, nothing in Figure 6 and column 8, lines 1-10 of Tsukamoto discloses such an insulator. Tsukamoto states, at column 5, lines 17-25, that an adhesive (#107) may attach the stiffener (#106) to the substrate (#108), but there is no disclosure that such an adhesive may be an insulator.

Claim 29 has been amended to recite that the stiffener is substantially made of a thermosetting plastic material. Tsukamoto fails to disclose such a substantially thermosetting plastic stiffener.

Claim 48 has been amended to recite that the stiffener is a molded stiffener. Tsukamoto fails to disclose such a molded stiffener.

Rejections Under 35 U.S.C. 103(a):

Claims 52-56 and 58-61 were rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukamoto in view of Smith et al. (US 5,694,297) (hereinafter "Smith"), and further in view of Werther (US 5,515,241) (hereinafter "Werther").

Claim 52 has been amended to recite that the substrate is a thin-core substrate that includes a thin core with a thickness between about 0.1 mm and 0.5 mm, and at least four laminate layers (at least two on either side of the thin core), none of the laminate layers having a thickness greater than about 30 microns. Support for these amendments can be found in Figure 6, on page nine of the Specification, which discloses a thin core 512' with a thickness between about 0.1 mm and 0.5 mm, multiple die side laminate layers 514' and pin side laminate layers 516', and in the first full paragraph of page eight of the Specification, which discloses the non-core layers as being between about 15 and 30 microns thick. None of Tsukamoto, Smith, or Werther disclose such a substrate.

Claim 54 has been amended to recite that the stiffener is an extruded stiffener. None of Tsukamoto, Smith, or Werther disclose such an extruded stiffener.

Claim 59 has been amended to recite that the stiffener has a top surface that is substantially co-planar with a top surface of a combination of an IC-die with an

integrated heat spreader (IHS). Tsukamoto fails to disclose a stiffener with a top surface substantially co-planar with a combination of an IC-die and IHS. Smith and Werther similarly fail to disclose such an arrangement.

Claim 60 has been amended to recite that the stiffener is disposable to co-support a heat sink with a combination IC-die and IHS. Tsukamoto fails to disclose such an arrangement. Smith and Werther similarly fail to disclose such an arrangement.

Claim 61 has been amended to remove the word “if” to positively recite that the main body of the stiffener is electrically conductive and that the stiffener includes an insulator. As discussed above with respect to claims 23 and 36, Tsukamoto fails to disclose a stiffener with an insulator to insulate electrical members on stiffener-opposing areas of the substrate.

Claims 14-18, 20-23, 27-31, 33-36, 46-49, and 51 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lim et al. (US 6,020,221) (hereinafter “Lim”) in view of Yamashita et al. (US 5,777,387) (hereinafter “Yamashita”), and further in view of Murasawa (US 5,841,188) (hereinafter “Murasawa”).

Claim 14 has been amended to recite that the thin-core or coreless substrate includes at least five layers, and that none of the layers has a thickness greater than about 0.5 mm. Claim 27 has been amended to recite that the thin-core or coreless substrate includes at least five layers. Claim 46 has been amended to recite that the coreless substrate is a coreless substrate that includes at least five layers, and that none of the layers has a thickness greater than about 30 microns.

None of Lim, Yamashita, or Murasawa discloses a substrate with at least five layers. Additionally, none of the cited references disclose thicknesses for all of the at least five layers, much less that none of the layers is greater than 0.5 mm thick (claim 14) or 30 microns thick (claim 46).

Claim 16 has been amended to recite that the stiffener is substantially made of a ceramic material, and to clarify language. The cited references fail to disclose such a substantially ceramic stiffener.

Claims 21 and 34 have been amended to recite that the stiffener has a top surface that is substantially co-planar with a top surface of a combination of an IC-die with an integrated heat spreader (IHS). The cited references fail to disclose a stiffener with a top surface substantially co-planar with a combination of an IC-die and IHS.

Claims 22, 35, and 51 have been amended to recite that the stiffener is disposable to co-support a heat sink with a combination IC-die and IHS. The cited references fail to disclose such an arrangement.

Claim 48 has been amended to recite that the stiffener is a molded stiffener. The cited references fail to disclose such a molded stiffener.

Conclusion:

Applicant respectfully submits that claims 14-18, 20-23, 27-31, 33-36, 46-49, 51-56, and 58-61 are patentable, and accordingly, the application is now in condition for allowance. Early issuance of the Notice of Allowance is respectfully requested.

The Commissioner is hereby authorized to charge shortages or credit overpayments to Deposit Account No. 500393. A Fee Transmittal is enclosed in duplicate for fee processing purposes. The Examiner is invited to call Michael Plimier at (408) 765-7857 if there remains any issue with allowance of this case.

Respectfully submitted,

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